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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/030,232

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Hye-Jeong Kim

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06/23/2006

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EXAMINER

CHOU, ALBERT T

ART UNIT

PAPER NUMBER

2616

DATE MAILED: 06/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/030,232

Applicant(s)

KIM, HYE-JEONG

Examiner

Albert T. Chou

Art Unit

2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on May 30, 2006 for the amendment.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2 and 4-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4 is/are allowed.
- 6) ☒ Claim(s) 2, 5 and 6 is/are rejected.
- 7) ☒ Claim(s) 7 and 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Response to Amendment***

1. The following is a response to the amendment filed on May 30, 2006:
  - Claims 2 and 4-8 are pending in the application.
  - Claims 1 and 3 are canceled.
  - Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata et al. (hereinafter "Shirakata"), in view of US Patent No. 5,694,389 to Seki et al (hereinafter "Seki").
  - Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata in view of US Patent No. 7,058,002 to Kumagai et al (hereinafter "Kumagai").
  - Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata in view of US Patent No. 7,058,002 to Kumagai, and further in view of US Patent No. 6,058,101 to Huang et al. (hereinafter "Huang").
  - Claim 4 is allowed
  - Claims 7 and 8 remain objected.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

Art Unit: 2616

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata et al. (hereinafter "Shirakata"), in view of US Patent No. 5,694,389 to Seki et al (hereinafter "Seki").

Regarding claim 2, Shirakata teaches an apparatus for compensating for a frequency offset using a pilot symbol for a transmitter in an OFDM system including a receiver for performing the fine frequency synchronization using a pilot symbol, comprising:

a pilot symbol inserter for receiving a spread data symbol stream and inserting a pilot symbol at intervals of predetermined data symbols **[Fig. 16, Data Modulation Portion 201; inserts the pilot carriers PC between the data carriers on the basis of the timing signal Sit; col. 13, lines 46-47];**

a serial-to-parallel (S/P) converter for receiving the pilot symbol-inserted data symbol stream, and outputting N data samples of a symbol unit in parallel **[Fig. 16, Serial-parallel Converting Portion 203; col. 13, lines 27-28];**

an inverse fast Fourier transform (IFFT) section for performing an IFFT operation on the N data samples **[Fig. 16, IFFT Portion 205; col. 13, line 30];**

a parallel-serial (P/S) converter for serializing the IFFT-transformed N data samples and outputting an OFDM symbol **[Fig. 16, IFFT Portion 205, Guard Insertion**

**Portion 207; The IFFT 205 converts the parallel data to the time-domain signal St, the serial signal, by applying inverse Fourier transform, col. 13, lines 56-58; a P/S converter function is obviously in IFFT 205 Portion since the serial format of signal is used for the rest portions of the OFDM Signal Generating Portion 200, see Fig. 16 & Fig. 1 of Applicant's specification]; and**

a guard interval inserter for inserting the guard interval between the OFDM symbols **[Fig. 16, Guard Insertion Portion 207; col. 13, lines 30-31].**

However, Shirakata does not expressly disclose that the guard interval inserter copies a part of the data samples of the OFDM symbol and inserts the copied data sample in the front of the OFDM symbol.

Seki discloses a guard interval inserter in an OFDM transmitting apparatus. The guard interval inserter copies a part of the data samples of the OFDM symbol and inserts the copied data sample in the front of the OFDM symbol **[Fig. 4; Guard Interval Inserting Circuit 209 copies the rear portion of a single OFDM symbol to the front of the symbol as a guard interval; col. 5, lines 66-67, col. 6, line 1].**

It would have been obvious to a person of ordinary skill in the art at the time of the invention to include a guard inserter which copies a part of the data samples of the OFDM symbol and inserts the copied data sample in the front of the OFDM symbol as disclosed in Seki into Shirakata's invention.

The motivation would have been to reduce the influence of the inter-symbol and multi-path interference in the OFDM system.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata et al. (hereinafter "Shirakata"), in view of US Patent No. 7,058,002 to Kumagai et al (hereinafter "Kumagai").

Regarding claim 5, Shirakata teaches an apparatus of compensating for a frequency offset using a pilot symbol for a receiver in an OFDM system comprising:

a first carrier synchronizer for receiving an OFDM symbol stream and performing approximate frequency synchronization using the guard interval [**Figs. 9 & 14; Clock Sync Est. Unit 102, col. 2, lines 56-63; Frequency Sync Est. Unit 104, col. 3, lines 1-15; Symbol Sync Est. Unit 106, col. 3, lines 16-30**];

a fast Fourier transform (FFT) section for performing an FFT operation and outputting the data symbol [**Fig. 9, FFT 5; col. 22, lines 25-28**];

a second carrier synchronizer for compensating for a fine frequency offset using the pilot symbol inserted in the data symbol stream [**Fig. 9, Phase Correction Unit 11 & Frequency Sync Establishing Unit 104; Fig. 4, Phase Correction Unit 11A; col. 22, lines 6-20**].

Shirakata does not expressly disclose a guard interval remover for removing the guard intervals from OFDM symbol streams after performing frequency synchronization.

Kumagai discloses a guard interval remover [**Figs. 1A & 43A, Guard Interval Removal Circuit 4/104**] for removing the guard intervals from OFDM symbol streams

after performing frequency synchronization [**Figs. 1A & 43A, Synchronization Circuit, 3/103; col. 2, lines 18-27**].

It would have been obvious to a person of ordinary skill in the art at the time of the invention to include a guard interval remover, as taught by Kumagai, by removing the guard interval from OFDM symbol streams after performing frequency synchronization in Shirakata's OFDM receiver as both teachings are related to an OFDM receiving apparatus.

The motivation would have been to allow the OFDM receiver to perform a first frequency synchronization using the guard intervals which are inserted at the OFDM transmitter and to ensure the transmitting signal is correctly restored at the OFDM receiver.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,618,352 to Shirakata et al. (hereinafter "Shirakata"), in view of US Patent No. 7,058,002 to Kumagai et al (hereinafter "Kumagai") and further in view of US Patent No. 6,058,101 to Huang et al. (hereinafter "Huang").

Regarding claim 6, Shirakata teaches a first carrier synchronizer for receiving an OFDM symbol stream and performing approximate frequency synchronization using the guard interval [**Figs. 9 & 14; Clock Sync Est. Unit 102, col. 2, lines 56-63; Frequency Sync Est. Unit 104, col. 3, lines 1-15; Symbol Sync Est. Unit 106, col. 3, lines 16-30**].

Shirakata and Kumagai do not expressly disclose the first synchronizer comprising a guard interval detector, a copied sample detector, a phase difference detector, an averager and a first frequency offset compensator.

Huang teaches a first synchronization system **[Huang: Figs. 3 and 6]**, which comprises a guard detector **[Huang: Fig. 3; envelop detector 10; col. 5, lines 36-40]**, a copied sample detector **[Huang: Fig. 6, Delay Circuit 72, First Arithmetic Circuit 74 & Multiplication Circuit 76; col. 8, lines 46-48]**, a phase difference detector **[Huang: Figs. 3 & 6; Second Arithmetic Circuit 77, Fractional Frequency Offset Estimation 40]**, an averager **[Huang: Figs. 3 & 6; Average Filter 50]**, and a first frequency offset compensator **[Huang: Fig. 6; Exponential Circuit 78 & Multiplication Circuit 75; col. 9, lines 32-33]**.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to implement a circuit for estimating fractional frequency offset of Huang into Shirakata's invention to perform the approximate frequency synchronization on the received OFDM symbol stream since the fractional frequency offset estimation is based on the introduction of guard interval.

The motivation would have been to provide approximate frequency synchronization on the received OFDM symbol stream prior to the removal of the guard interval and therefore increase the accuracy of calculating fine frequency offset at the second carrier synchronizer.



***Allowable Subject Matter***

3. Claim 4 is allowed.
4. Claims 7 and 8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

5. Applicant's arguments with respect to claims 2, 5 and 6 have been considered but are moot in view of the new ground(s) of rejection.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert T. Chou whose telephone number is 571-272-6045. The examiner can normally be reached on 8:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571-272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


Art Unit: 2616

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Albert T. Chou

June 21, 2006

Ac



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